THE BEARABLE LIGHTNESS OF BEING AN AIRSHIP

GRAHAM WARWICK/WASHINGTON

They are energy efficient and can scale to provide extreme persistenc e or carry heavy loads. They have also been around since the dawn of aviation, but airships are attracting renewed attention for missions ranging from surveillance to logistics.

Airships have a reputation for being difficult to launch and recover, particularly in winds, and recent developments have focused on hybrid designs to overcome this. Hybrid airships are heavier than air, and use a mix of buoyant, aerodynamic and propulsive lift.

Aeros, a U.S. manufacturer of sma,ll non-rigid airships, is now developing the Aeroscraft ML866, a large hybrid that features lightweight, rigid hull, dynamic buoyancy management and low-speed control technologies developed by the company. The cargo market is the target audience.

AEROS WORLDWIDE

Aeros has tested a 75-ft.-long subscale version of the lightweight composite aerostructure for its planned ML866 rigid-hull hybrid airship.

The buoyancy-management system controls the vehicle's static heaviness by compressing, storing and releasing helium via a lightweight compressor and tanks. This allows lift to be controlled so the vehicle can land, offload cargo, load up and take off without the need for ground infrastructure or ballast.

Aeros recently built and tested a 75-ft.-long hull—a scaled-down ML866—to demonstrate its lightweight rigid structure of non-autoclave composite frames and skins. The hull was subjected to loads simulating airspeeds up to 100 kt. and to critical maneuvers. Aeros founder Igor Pasternak says the rigid structure, scaled up to the 250-ft.-long ML866, will weigh in around 1.5 lb.-sq.-ft. and be competitive on cost with fabric.

Other approaches to making airships more usable include U.S.-German joint-venture Sanswire-TAO's STS-111 medium-altitude long-endurance UAV, an unusual multi-segment, non-rigid airship. The STS-111 is designed to be unpacked and launched rapidly, the flexible envelope "wiggling" to cope with winds, and then be recovered by parachute.

Buoyancy is provided by helium in the first segment, which carries payload and thrust-vectoring propulsion, but the rest of the envelope is filled with "fuelgas," a neutrally buoyant mix that is consumed by the engine. The 111-ft.-long airship is intended to stay aloft up to 15,000 ft. for 60 hr. carrying a 20-lb. payload.

L-3 Communications will act as systems integrator and operator of the STS-111 for customer demonstrations and deployments. Sanswire-TAO plans to deliver the first airship to L-3 in early 2010 for integration of the command-and-control and sensor systems.

Another approach to launching a surveillance airship in theater with minimal support is the HiSentinel, being developed by Southwest Research Institute and built by Aerostar International under a U.S. Army technology-demonstration program. This non-rigid, high-altitude airship would be launched partially inflated, like a balloon, the helium expanding as it rises until the hull is completely inflated into an aerodynamic shape.

There have been two HiSentinel test flights, in 2005 and 2008, and a third is planned this month. The demonstration goal is to lift a 100-lb. payload above 67,000 ft. for two days; an operational HiSentinel would be capable of carrying a 200-lb. payload aloft for 30 days, according to the Army. The airship is expendable, but the payload recoverable.

Heavy lifting has long been seen as an ideal role for airships, but Canada's SkyHook International has added a twist with its Heavy-Lift Vehicle (HLV), which combines a helium airship with a multi-rotor helicopter. The airship's buoyancy carries the weight of the vehicle, allowing the thrust from four rotors to be used to hoist payloads.

SkyHook has partnered with Boeing to design the 430-ft.-long HLV, which would carry a 40-ton underslung payload 200 mi. The company is based in Calgary, Alberta, a major oil and gas center, and the target focus for SkyHook's services is the movement of exploration rigs and other heavy equipment across the Arctic tundra without the expense and environmental impact of constructing ice roads.

SkyHook is paying Boeing to design the HLV in phases, as it raises funding. So far, the manufacturer has frozen the configuration and completed critical systems selection, resulting in a baseline aircraft design. Plans are to fly the vehicle in 2014, but SkyHook is still looking for customers and financing. Japanese operator Nippon Airships has agreed to help market the HLV.

Airships still have the power to capture the imagination, evidenced by a group of French students who are crafting a vehicle with which they hope to make the first manned solar-powered airship crossing of the English Channel, to demonstrate emissionless flight.

Their 72-ft.-long airship, Nephelios, has flexible solar arrays on its upper surface powering an electric motor that drives a pair of propellers either side of the single-pilot gondola. It will cruise at around 18 kt., at altitudes up to 1,600 ft.